UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/823,483	04/12/2004	Avto Tavkhelidze		4951

7590 12/27/2006

Borealis Technical Limited
23545 NW Skyline Blvd
North Plains, OR 97133-9204

EXAMINER	
TAMAI, KARL I	
ART UNIT	PAPER NUMBER
2834	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/27/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/823,483	TAVKHELIDZE ET AL.	
	Examiner	Art Unit	
	Tamai I.E. Karl	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2006*.

2a)☐ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shakouri et al. (Shakouri)(US 5955772) and Fitzpatrick ("Close-Spaced Thermionic Converters with Active Spacing Control and Heat Pipe Isothermal Emitters"). Shakouri teaches a vacuum thermionic heat pump with a cathode and anode 12, 16 spaced from each other across a vacuum 14, and an external circuit with a power source. Shakouri teaches every aspect of the invention but does not teach a positioning means for positioning the electrodes or capacitor sensors. Fitzpatrick teaches a capacitor

sensors and piezoelectric actuators (see page 924) to position the electrodes in a thermal energy transfer device. Fitzpatrick teaches three sensors and three actuators to maintain the parallel surfaces, which suggests independent control of the actuator by the microprocessor. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the heat pump of Shakouri with the actuators of Fitzpatrick to provide adjustable electrodes of increased efficiency and power density.

4. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shakouri et al. (Shakouri)(US 5955772) and Fitzpatrick ("Close-Spaced Thermionic Converters with Active Spacing Control and Heat Pipe Isothermal Emitters"), in further view of Richards (US 4281280). Shakouri and Fitzpatrick teach every aspect of the invention except the inert gas argon between the electrodes. Richards teaches the region between the electrodes can be either evacuated or filled with an inert gas such as argon to transport energy from the emitter to the collector. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the machine of Shakouri and Fitzpatrick with the region between the electrodes being evacuated or filled with argon because Richards teaches that the vacuum or argon allows the transportation of electrons from the cathode to the anode, and because it has been held that selection of know equivalents is within the ordinary skill in the art.

5. Claims 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shakouri et al. (Shakouri)(US 5955772) and Fitzpatrick ("Close-Spaced Thermionic

Converters with Active Spacing Control and Heat Pipe Isothermal Emitters"), in further view of Huffman ("Preliminary Investigations of a Thermotunnel Converter"). Shakouri and Fitzpatrick teach every aspect of the invention except the electrons tunneling between the emitter and collector, and the spacing being within 200 angstroms (claims 11-14). Huffman teaches the closing spaced electrodes causes a qualitative increase in the operation of thermionic devices, such as 10 angstroms. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the heat pump of Shakouri and Fitzpatrick with the spacing of 10 angstroms causing tunneling to improve the qualitative operation of the device as taught by Huffman.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karl I.E. Tamai whose telephone number is (571) 272 - 2036. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Darren Schuberg, can be reached at (571) 272 - 2044. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Karl I Tamai
PRIMARY PATENT EXAMINER
December 21, 2006

KARL TAMAI
PRIMARY EXAMINER